# NOAA Technical Memorandum NMFS


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Michele A. Finn
John R. Henderson
Brenda L. Becker
Timothy J. Ragen

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

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Brenda L. Becker, Timothy J. Ragen

Honolulu Laboratory,SWFSC
National Marine Fisheries Service, NOAA
2570 Dole Street
Honolulu, Hawaii 96822-2396

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**U.S. DEPARTMENT OF COMMERCE**
Ronald H. Brown, Secretary
**National Oceanic and Atmospheric Administration**
D. James Baker, Under Secretary for Oceans and Atmosphere
**National Marine Fisheries Service**
William W. Fox, Jr., Assistant Administrator for Fisheries

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## ABSTRACT

On 8-9 June 1990, research was conducted on the Hawaiian monk seal (Monachus schauinslandi) and the green turtle (Chelonia mydas) at Pearl and Hermes Reef in the Northwestern Hawaiian Islands. Two atoll-wide surveys resulted in monk seal counts of 46.0 and 32.0 seals, excluding pups and 55.0 and 40.0 seals, including pups. Ten pups were sighted, including 7 that had weaned and 3 that were still nursing. Six of the 7 weaned pups were tagged. Although no mortalities or entanglements were observed in monk seals, 4 injuries were noted.

During the 1991 field season, the Hawaiian monk seal and the green turtle were studied from 1 August to 13 September. Excluding pups, atoll-wide beach counts of seals ranged from 33 to 60 animals ($\bar{x}$ = 46.5, SD = 8.4), and counts including pups ranged from 40 to 75 seals ($\bar{x}$ = 53.6, SD = 9.8). Two yearlings and 8 2-yr-olds were weighed and measured, and 21 weaned pups and 14 unknown-age juveniles and subadults were tagged. Two seals that had lost a tag were retagged. Although no monk seal deaths were noted, 6 injuries, including 2 entanglement scars, were observed. Twelve green turtles were tagged, and 37 previously tagged green turtles were resighted. Three turtles were seen with severe shark-inflicted injuries; one of these died.

## INTRODUCTION

Pearl and Hermes Reef (lat. 27°55'N, long. 175°45'W), located within the Northwestern Hawaiian Islands, is one of eight known breeding, pupping, and haul-out sites for the endangered Hawaiian monk seal, *Monachus schauinslandi*. The threatened green turtle, *Chelonia mydas*, uses Pearl and Hermes Reef as a foraging, basking, and nesting site. Population studies have been conducted on the Hawaiian monk seal and green turtle by the National Marine Fisheries Service (NMFS) since 1982 (Kam 1986, Forsyth et al. 1988, Choy and Hiruki 1992).

The primary objectives at Pearl and Hermes Reef in 1990 were limited to conducting atoll-wide seal censuses, resighting tagged seals, tagging weaned pups, and surveying and destroying debris capable of entangling seals or turtles. In addition to these objectives, efforts in 1991 included retagging seals with broken or missing tags, tagging unknown-age seals, weighing and measuring immature seals, and bleach-marking seals for identification purposes. Also, interatoll movement, survival, injuries, and entanglements of seals were monitored, seal scats and spews were collected, basking turtles were tagged, and previously tagged turtles were resighted. This report summarizes the data collected during 1990 and 1991.

## MATERIALS AND METHODS

Data were collected during 8-9 June 1990 and 1 August-13 September 1991 at Pearl and Hermes Reef. This coral atoll is composed of four vegetated and three non-vegetated sand islands surrounded by a fringing reef (Fig. 1). Sandbars associated with some of the islands appear and disappear on a seasonal basis. Amerson et al. (1974) describes the history, geology, and biodiversity of Pearl and Hermes Reef. During both years, field camps were established on Southeast Island and North Island. The itinerary of both 1990 and 1991 fieldwork is presented in Appendix A.

### Individual Seal Identification

Stone (1984) describes the procedures for Hawaiian monk seal identification and size classification. Tags and natural markings were used to identify individual seals and, when possible, seals were classified by size and sex. Weaned pups were tagged with a light-blue, plastic Temple Tag® on each hind flipper by the method described by Gilmartin et al. (1986). In 1991, most pups also received two Passive Integrated Transponder (PIT) tags injected subcutaneously in each ankle. Untagged juveniles and subadults were tagged on each hind flipper with light blue, plastic Temple Tags on an opportunistic basis. Whenever possible, photographs were taken and scar cards were drawn for individual seals to supplement the individual identification files. Additionally, untagged adult and immature seals were bleach-marked to facilitate identification.

## Seal Censuses and Patrols

Census data were recorded on the standard census form (Forsyth et al. 1988) following the 1990 coding instructions in Lee et al. (1993). Atoll-wide censuses were conducted on both days spent at Pearl and Hermes Reef in 1990; additional sightings of identified animals were recorded as incidental sightings on separate census sheets. In 1991, full atoll counts were conducted twice a week, and all atoll censuses were completed in a single day. North, Little North, and Southeast Islands were censused daily. Again, sightings of identified seals obtained during incidental patrols were documented on separate census forms.

## Seal Measurements

In 1991, weaned pups, yearlings, and 2-yr-old seals were weighed and measured for axillary girth and straight dorsal length (American Society of Mammologists 1967, Gilmartin et al. 1986).

## Turtle Research

During censuses and patrols in 1990 and 1991, turtle sightings were recorded on the same census forms used for seal counts. However, turtle research was limited in 1990 to basking turtle counts, turtle tag resightings, and turtle pit documentation. In 1991, tagged turtles were resighted, turtle injuries and nesting behavior were documented, and basking turtles were tagged and measured.

### Collection of Samples

As described by Johanos and Kam (1986), all nets, lines, ropes, and other debris capable of entangling seals or turtles were accumulated, cataloged, and destroyed during both field seasons on every island with the exception of Seal-Kittery Island in 1990 when debris were destroyed but not cataloged. In 1990, tissue plugs obtained during tagging operations were retained, frozen, and returned to Honolulu for DNA analysis and evaluation of population structure. And in 1991, monk seal scats and spews were collected and processed as described in Forsyth et al. (1988). All collected samples are currently being analyzed.

## RESULTS AND DISCUSSION

### Monk Seals

#### Census Data

In 1990, beach counts were 46.0 and 32.0, excluding pups and 55.0 and 40.0, including pups. In 1991, atoll counts of seals other than pups ranged from 33 to 60 animals ($\bar{x}$ = 46.5, $n$ = 11, SD = 8.4; Table 1). Including pups, the counts ranged from 40 to 75 ($\bar{x}$ = 53.6, $n$ = 11, SD = 9.8; Table 1). Separate island censuses for both 1990 and 1991 are presented in Appendix B.

#### Reproduction

Of 10 pups sighted in 1990, 7 had weaned and 6 of those were flipper-tagged (5 males, 1 female; Tables 2 and 3); the remaining 3 were not tagged because they were still nursing.

In 1991, 21 pups were tagged with plastic Temple Tags (9 males, 12 females; Tables 2 and 3), and 19 also received PIT tags.

**Measurements and Non-Pup Tagging Effort**

In 1991, 10 unknown-aged juveniles and 4 subadults of unknown ages were also tagged with Temple Tags. Two seals observed to have lost a tag were retagged (Table 3).

Axillary girth, straight dorsal length, and weight measurements for 21 weaned pups, 2 yearlings, and 8 2-year-olds are listed in Table 4. All of these measurements were made in 1991.

**Interatoll Movement**

In 1990, an adult male seal, originally bleach-marked at Kure Atoll, was observed at Pearl and Hermes Reef, and an adult male originally tagged at Pearl and Hermes Reef was sighted at Laysan Island (Table 5).

Five interatoll movements to or from Pearl and Hermes Reef were documented in 1991 (Table 5). Three adults originally tagged at Pearl and Hermes Reef and observed there in 1990 had emigrated by 1991: one male and one female to Midway Islands and one female to Laysan Island. Additionally, two seals originally tagged at Kure Atoll, an adult female and a juvenile female, were observed at Pearl and Hermes Reef in 1991.

**Population Estimate**

In 1991, 77 previously tagged (and permanently identified) seals were resighted at Pearl and Hermes Reef; 3 of these had been tagged as pups at other locations. Five untagged seals that

had previously been given permanent identities were recognized by scar patterns. In addition, permanent identities were given to seals tagged during the field season, including 21 pups and 14 seals of unknown age, and to 4 seals with scars that were sufficiently distinct to allow future recognition of these individuals. By the end of the 1991 season, 121 seals were permanently identified. In addition, 34 other seals were known temporarily (within the 1991 season) on the basis of bleach marks. The number of seal identified either on a permanent or temporary basis was, therefore, 155. An estimated 5-10 seals remained untagged and unmarked when personnel departed at the end of the season. Thus, the total population estimate for Pearl and Hermes Reef in 1991 was 160-165 seals. The composition of the known population consisted of 21 pups (12 females, 9 males), 28 juveniles (12 females, 16 males), 36 subadults (15 females, 21 males), and 72 adults (38 females, 34 males).

**Injuries, Deaths, and Survival**

All four injuries observed on Hawaiian monk seals at Pearl and Hermes Reef in 1990 (Table 6) were probably inflicted by adult males. Of the four monk seal injuries documented in 1991 (Table 6), two were probably male-inflicted injuries, and one was attributed to a cookie cutter shark (*Isistius brasiliensis*). The cause of the remaining injury was unknown. Also, blood was observed around the penile aperture of an adult male seal, but the nature of the presumed injury was not apparent.

No seal deaths were documented in 1990 or 1991. Table 7 summarizes survival by cohort since 1983 and includes seals originally sighted at Pearl and Hermes Reef and documented at other locations.

**Entanglements**

No entanglements were observed in 1990. However, an adult seal was seen hauled-out on a pile of netting that was attached to the reef in the middle of the atoll between Southeast and North Islands. In 1991, 2 monk seals were observed with neck scars attributed to entanglement in marine debris (Table 8).

## Green Turtles

In 1990, 2 previously tagged turtles were resighted, and 2 turtle pits were documented on North Island. During the 1991 field effort, 37 previously tagged turtles were resighted (31 adult and 6 immature), and 12 turtles were tagged (6 adult and 6 immature). In addition, 1 turtle was observed backfilling a pit on Southeast Island, and three shark-inflicted injuries to adult male turtles were recorded. All three injuries resulted in amputation of a hind flipper and part of the tail. In one case, the injury was fatal, a necropsy was performed, and results will be reported elsewhere.

## Samples Collected

Six tissue plug samples were collected from weaned pups in 1990. In 1991, necropsy samples from an adult male turtle were preserved and transported to Honolulu, and 18 seal scats and 1 spewing were collected. Also, 262 samples of potentially entangling marine debris were documented and destroyed in 1990,

and 572 pieces of debris were documented, sampled, and destroyed during the 1991 field season.

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Table 1.--Hawaiian monk seal atoll counts at Pearl and Hermes Reef (M = male, F = female, and U = unknown sex).

| | Adult | | | Sub-adult | | | Juvenile | | | Pup | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | M | F | U | M | F | U | M | F | U | M | F | U | Nonpup | Pup | Combined |
| **1990** | | | | | | | | | | | | | | | |
| 6/08 | 7 | 11 | 8 | 4 | 8 | 2 | 0 | 3 | 3 | 5 | 1 | 3 | 46 | 9 | 55 |
| 6/09[a] | 5 | 11 | 5 | 6 | 3 | 1 | 1 | 0 | 0 | 3 | 1 | 4 | 32 | 8 | 40 |
| **1991** | | | | | | | | | | | | | | | |
| 8/06 | 5 | 10 | 7 | 10 | 9 | 2 | 7 | 4 | 6 | 8 | 3 | 4 | 60 | 15 | 75 |
| 8/09 | 8 | 9 | 2 | 5 | 5 | 3 | 3 | 3 | 3 | 6 | 4 | 2 | 42[b] | 12 | 54 |
| 8/13 | 8 | 11 | 4 | 8 | 4 | 2 | 3 | 3 | 1 | 3 | 0 | 0 | 44 | 3 | 47 |
| 8/15 | 7 | 10 | 1 | 7 | 2 | 0 | 2 | 3 | 1 | 3 | 4 | 0 | 33 | 7 | 40 |
| 8/21 | 8 | 10 | 1 | 10 | 1 | 0 | 3 | 2 | 0 | 4 | 4 | 0 | 35 | 8 | 43 |
| 8/24 | 10 | 12 | 2 | 6 | 5 | 1 | 4 | 2 | 1 | 4 | 2 | 0 | 43 | 6 | 49 |
| 8/28 | 17 | 10 | 1 | 5 | 8 | 0 | 6 | 3 | 0 | 5 | 1 | 0 | 50 | 6 | 56 |
| 8/31 | 10 | 9 | 3 | 10 | 4 | 1 | 4 | 4 | 1 | 3 | 0 | 0 | 46 | 3 | 49 |
| 9/1 | 10 | 11 | 1 | 9 | 7 | 1 | 6 | 2 | 0 | 3 | 5 | 0 | 47 | 8 | 55 |
| 9/6 | 11 | 14 | 6 | 9 | 4 | 1 | 2 | 6 | 2 | 3 | 4 | 0 | 55 | 7 | 62 |
| 9/8 | 13 | 13 | 7 | 6 | 4 | 3 | 4 | 4 | 2 | 2 | 2 | 0 | 56 | 4 | 60 |

[a]Totals exclude Bird Island.
[b]Total includes some seals which were not placed in any size class.

Table 2.--Birth summary of Hawaiian monk seal pups at Pearl and Hermes Reef (M = male, F = female, U = unknown sex, AG = axillary girth, and SL = straight dorsal length).

| ID No. | Sex | Birth | | Weaning | | Nursing period (days) | Measurements (cm)[a] | | | Weight (kg) | Mother ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | Islet/ Sector | Date | Islet/ Sector | | Date | AG | SL | | |
| **1990** | | | | | | | | | | | |
| BG70 | F | -- | -- | <6/08 | -- | -- | 6/08 | 89.0 | 118.0 | -- | -- |
| BG72 | M | -- | -- | <6/08 | -- | -- | 6/08 | 78.0 | 123.0 | -- | -- |
| BG74 | M | -- | -- | <6/08 | -- | -- | 6/08 | 109.0 | 128.0 | -- | -- |
| BG76 | M | -- | -- | <6/08 | -- | -- | 6/08 | 104.0 | 121.0 | -- | -- |
| BG78 | M | -- | -- | <6/08 | -- | -- | 6/08 | 113.0 | 134.0 | -- | -- |
| B2AI | M | -- | -- | <6/08 | -- | -- | 6/08 | -- | -- | -- | -- |
| H | U | -- | SK[b] | 6/09 | SK/3 | -- | -- | -- | -- | -- | Gp |
| -- | U | <6/08 | NI[cd] | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | U | <6/08 | NI[c] | -- | -- | -- | -- | -- | -- | -- | -- |
| -- | U | <6/08 | NI[c] | -- | -- | -- | -- | -- | -- | -- | -- |
| **1991** | | | | | | | | | | | |
| BZ00 | M | -- | -- | <8/05 | -- | -- | 8/05 | 79.0 | 123.5 | 34.9 | -- |
| BZ02 | M | -- | -- | <8/05 | -- | -- | 8/05 | 95.0 | 123.0 | 52.6 | -- |
| BZ04 | M | -- | -- | <8/05 | -- | -- | 8/05 | 101.5 | 129.0 | 61.2 | -- |
| BZ06 | F | -- | -- | <8/05 | -- | -- | 8/07[e] | 104.5 | 152.0 | 62.1 | -- |
| BZ08 | F | -- | -- | <8/05 | -- | -- | 8/08 | 87.5 | 122.0 | 40.8 | -- |
| BZ10 | F? | -- | -- | <8/05 | -- | -- | 8/09 | 98.0 | 122.5 | -- | -- |
| BZ12 | F | -- | -- | <8/05 | -- | -- | 8/10 | 103.0 | 139.0 | 71.9 | -- |
| BZ14 | F | -- | -- | <8/05 | -- | -- | 8/10 | 82.0 | 130.0 | -- | -- |
| BZ16 | F | -- | NI | 8/17 | NI/1 | -- | 8/19 | 123.5 | 132.0 | 103.6 | -- |
| BZ18 | F | -- | NI | 8/17 | NI/1 | -- | 8/19 | 115.5 | 127.0 | 87.8 | -- |
| BZ20 | F | -- | -- | <8/04 | -- | -- | 8/04 | 82.5 | 132.0 | 45.8 | -- |
| BZ22 | M | -- | -- | <8/04 | -- | -- | 8/04 | 86.0 | 131.0 | 44.9 | -- |
| BZ26 | M | -- | -- | <8/06 | -- | -- | 8/06 | 102.0 | 128.0 | 60.3 | -- |
| BZ29 | M | -- | -- | <8/04 | -- | -- | 8/04 | 96.5 | 128.0 | 45.8 | -- |
| BZ31 | F | -- | -- | <8/04 | -- | -- | 8/16 | 84.0 | 124.0 | 40.4 | -- |
| BZ33 | F | -- | -- | <8/05 | -- | -- | 9/06 | 84.5 | 124.5 | 44.5 | -- |

Table 2.--Continued.

| ID No. | Sex | Birth | | Weaning | | Nursing period (days) | Measurements (cm)[a] | | | Weight (kg) | Mother ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | Islet/ Sector | Date | Islet/ Sector | | Date | AG | SL | | |
| BZ35 | M | -- | -- | <8/05 | -- | -- | 9/09 | 87.0 | 124.0 | 45.4 | -- |
| BZ39 | F | -- | -- | <8/06 | -- | -- | 8/06 | 76.0 | 116.0 | 31.8 | -- |
| BZ43 | M | -- | -- | <8/06 | -- | -- | 8/09 | 92.5 | 129.0 | 47.2 | -- |
| BZ45 | F | -- | -- | <8/05 | -- | -- | 8/25 | 92.5 | 132.5 | 51.7 | -- |
| BZ50 | M | -- | -- | <8/06 | -- | -- | 8/06 | 100.0 | 125.0 | 61.7 | -- |

[a]Measurements and weights taken after weaning.
[b]SK = Seal-Kittery Island.
[c]Still nursing at end of field season.
[d]NI = North Island.
[e]AG measurement taken on 8/07; SL and weight taken on 8/29.

Table 3.--Hawaiian monk seals tagged at Pearl and Hermes Reef. All tags are newly applied unless other wise noted (S = subadult, J = juvenile, W = weaned pup, M = Male, and F = female).

| ID No. | Size | Sex | Temp. No. | Left tag | | Right tag | | Tag Date |
|---|---|---|---|---|---|---|---|---|
| | | | | Tag No.[a] | PIT[b] | Tag No.[a] | PIT[b] | |
| | | | | **1990** | | | | |
| BG70 | W | F | -- | G70 | -- | G71 | -- | 6/08 |
| BG72 | W | M | -- | G72 | -- | G73 | -- | 6/08 |
| BG74 | W | M | -- | G74 | -- | G75 | -- | 6/08 |
| BG76 | W | M | -- | G76 | -- | G77 | -- | 6/08 |
| BG78 | W | M | -- | G78 | -- | G79 | -- | 6/08 |
| B2AI | W | M | -- | 2AI | -- | 2AJ | -- | 6/08 |
| | | | | **1991** | | | | |
| BZ00 | W | M | -- | Z00 | 7F7D01687B | Z01 | 7F7D016838 | 8/05 |
| BZ02 | W | M | -- | Z02 | 7F7D020D27 | Z03 | 7F7D015269 | 8/05 |
| BZ04 | W | M | -- | Z04 | 7F7F7F206C | Z05 | 7F7D02590B | 8/05 |
| BZ06 | W | F | -- | Z06 | 7F7D1D266D | Z07 | 7F7D1E1C68 | 8/07[c] |
| BZ08 | W | F | -- | Z08 | 7F7D1D7C32 | Z09 | 7F7D1E176E | 8/08[d] |
| BZ10 | W | F? | -- | Z10 | -- | Z11 | -- | 8/09 |
| BZ12 | W | F | -- | Z12 | 7F7D1D122A | Z13 | 7F7D1E112A | 8/10[e] |
| BZ14 | W | F | -- | Z14 | -- | Z15 | -- | 8/10 |
| BZ16 | W | F | -- | Z16 | 7F7D1E3258 | Z17 | 7F7D1D4342 | 8/19 |
| BZ18 | W | F | -- | Z18 | 7F7D1A4B55 | Z19 | 7F7D1D186E | 8/19 |
| BZ20 | W | F | -- | Z20 | 7F7D1E2516 | Z21 | 7F7D1D2314 | 8/04[f] |
| BZ22 | W | M | -- | Z22 | 7F7D1E1863 | Z23 | 7F7D1E2425 | 8/04[g] |
| BZ26 | W | M | -- | Z26 | 7F7F430606 | Z27 | 7F7F7A6C69 | 8/06 |
| BZ29 | W | M | -- | Z29 | 7F7D1E3168 | Z30 | 7F7D1D165E | 8/04[h] |
| BZ31 | W | F | -- | Z31 | 7F7D1E3074 | Z32 | 7F7D1D215A | 8/16[i] |
| BZ33 | W | F | -- | Z33 | 7F7D1E332F | Z34 | 7F7D1D3142 | 9/06 |
| BZ35 | W | M | -- | Z35 | 7F7D1D2836 | Z36 | 7F7DIE301C | 9/09 |
| BZ39 | W | F | -- | Z39 | 7F7D01712C | Z40 | 7F7D1E2C00 | 8/06 |
| BZ43 | W | M | -- | Z43 | 7F7D1E227C | Z44 | 7F7D1E2C01 | 8/09 |
| BZ45 | W | F | -- | Z45 | 7F7D1E239[j] | Z46 | 7F7D1E450F | 8/25 |
| BZ50 | W | M | -- | Z50 | 7F7D1E2A3E | Z51 | 7F7D1E3605 | 8/06 |

Table 3.--Continued.

| ID No. | Size | Sex | Temp. No. | Left tag | | Right tag | | Tag Date |
|---|---|---|---|---|---|---|---|---|
| | | | | Tag No.[a] | PIT[b] | Tag No.[a] | PIT[b] | |
| B1AC | J | M | -- | 1AC | -- | 1AD | -- | 8/09 |
| B1AG | J | F | -- | 1AG | -- | 1AH | -- | 8/11 |
| B1AI | S | F | -- | 1AI | -- | 1AJ | -- | 8/13 |
| B1AK | S | M | -- | 1AK | -- | 1AL | -- | 8/15 |
| B1AM | J | F | -- | 1AM | -- | 1AN | -- | 8/28 |
| B1AO[k] | J | M | -- | 1A0 | 7F7D1D4166 | 1AP | 7F7D1D186A | 9/01 |
| B1AU | J | M | -- | 1AU | -- | 1AW | -- | 8/27 |
| B2AA[l] | S | M | -- | -- | -- | 2AB | -- | 9/02 |
| B2AC | J | F | -- | 2AC | -- | 2AD | -- | 8/30 |
| B2AG | J | F | -- | 2AG | -- | 2AH | -- | 9/04 |
| B2AM | J | F | -- | 2AM | -- | 2AN | -- | 8/22 |
| B2AO | J | F | -- | 2AO | -- | 2AP | -- | 8/22 |
| B2AQ | J | M | -- | 2AQ | -- | 2AR | -- | 8/23 |
| B2AS | S | F | -- | 2AS | -- | 2AT | -- | 8/24 |
| BU24[m] | S | F | -- | U24 | -- | U56 | -- | 9/01 |
| BL06[n] | S | M | -- | L06 | -- | L81 | -- | 9/11 |

[a]Color of tag is blue unless otherwise noted. Type of tag is Temple unless otherwise noted.
[b]Passive Integrated Transponder.
[c]Temple tag applied on 8/07; PIT tag applied on 8/29.
[d]Temple tag applied on 8/08; PIT tag applied on 8/11.
[e]Temple tag applied on 8/10; PIT tag applied on 8/16.
[f]Temple tag applied on 8/04; PIT tag applied on 8/07.
[g]Temple tag applied on 8/04; PIT tag applied on 8/27.
[h]Temple tag applied on 8/04; PIT tag applied on 8/09.
[i]Temple tag applied on 8/16; PIT tag applied on 9/03.
[j]One digit missing from the number.
[k]Originally tagged as a weanling on 8/04 but removed 1991 cohort tags and replaced with unknown age tags on 9/01. Also, pit tags were applied at original tagging.
[l]Unable to insert Temple Tag on left hind flipper.
[m]Right tag (U25) was missing and was replaced with U56.
[n]Right tag (L07) was missing and was replaced with L81.

Table 4.--Measurements and weights of immature Hawaiian monk seals at Pearl and Hermes Reef (M = male, F = female, AG = axillary girth, STDL = standard/ventral length, and SL = straight/dorsal length). All measurements taken in 1991.

| ID No. | Sex | Date | Measurements (cm) AG | STDL | SL | Weight (kg) |
|---|---|---|---|---|---|---|
| | | | **2-year-olds** | | | |
| BU10 | M | 8/21 | 106.0 | -- | 168.0 | 92.5 |
| BU12 | F | 8/15 | 103.0 | -- | 168.0 | 89.4 |
| BU14 | M | 8/20 | 104.0 | -- | 152.0 | 70.8 |
| BU16 | F | 8/09 | 101.0 | -- | 152.0 | 73.5 |
| BU18 | M | 9/04 | 110.0 | -- | 165.0 | 82.6 |
| BU20 | M | -- | 121.0 | -- | 151.5 | -- |
| BU24 | F | 8/26 | 120.0 | -- | 162.0 | 118.6 |
| BU30 | M | 8/08 | 101.0 | -- | 153.0 | 65.8 |
| | | | **Yearlings** | | | |
| BG70 | F | 8/07 | 90.0 | -- | 145.0 | 64.4 |
| BG72 | M | 8/08 | 94.0 | -- | 144.0 | 61.2 |

Table 5.--Interisland movement of Hawaiian monk seals at Pearl and Hermes Reef (A = adult, S = subadult, J = juvenile, M = male, F = female, L = left, and R = right).

| ID No. | Temp. No. | Tag No. L | Tag No. R | Tag color[a] | Size | Sex | Movement from: Location | Movement from: Date last seen | Movement to: Location | Movement to: Date first seen |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **1990** | | | | |
| BT18 | 210 | -- | T18 | B | A | M | P&H | 6/22/88 | Laysan | 5/02/90 |
| K610 | 15 | -- | -- | -- | A | M | Kure | 3/06/90 | P&H[b] | 6/09/90 |
| | | | | | | **1991** | | | | |
| BL32 | -- | L32 | L33 | B | A | F | P&H | 6/08/90 | Laysan | 4/05/91 |
| BK01 | -- | K00 | K01 | B | A | M | P&H | 6/08/90 | Midway | 3/01/91 |
| BK33 | -- | K33 | K32 | B | A | F | P&H | 6/08/90 | Midway | 3/27/91 |
| TU04 | -- | U04 | U05 | T | S | M | Laysan | 6/04/89 | P&H | 8/07/91 |
| K143 | -- | O32 | O33 | K | A | F | Kure | 5/20/90 | P&H | 8/31/91 |
| KG08 | -- | G08 | G07 | K | J | F | Kure | 7/17/90 | P&H | 8/07/91 |

[a]Tag colors: B = blue, K = gray, and T = tan.
[b]P&H = Pearl and Hermes Reef.

Table 6.--Injuries of Hawaiian monk seals at Pearl and Hermes Reef (A = adult, S = subadult, W = weaned pup, M = male, and U = unknown sex).

| Injury No. | Date | Age of injury | Size | Sex | ID No. | Description of injury: Type[a] | Location[b] | Depth[c] layer | Dimension (cm) (1 x w or diam) | Probable cause |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **1990** | | | | |
| 001 | 6/08 | -- | W | M | BG74 | LAC | LAT | SB | -- | male HMS[d] |
| 002 | 6/08 | -- | W | M | BG76 | LAC | LAT | SB | -- | male HMS |
| 003 | 6/08 | -- | W | M | BG78 | LAC | R/LAT | SB | -- | male HMS |
| 004 | 6/08 | -- | A | U | B[e] | LAC | D | SB | -- | male HMS |
| | | | | | | **1991** | | | | |
| 001 | 8/09 | Fresh | S | M | BK21 | CIR | L/LAT | B | 5 diam. | cc shark[f] |
| 002 | 8/17 | Fresh | A | M | 473[e] | LAC | D | SB | 20 length | male HMS |
| 003 | 9/01 | Old | A | M | 511[e] | ABC | RHF | SB | 3 diam. | male HMS |
| 004 | 9/06 | -- | A | M | BL21 | OTH[g] | RHF | -- | -- | unknown |

[a]Codes for Type:
ABC = abcess
LAC = laceration
CIR = circular wound
OTH = other

[b]Codes for Location:
L = left
R = right
D = dorsal
RHF = right hindflipper
LAT = lateral

[c]Codes for Depth:
SB = skin broken
B = blubber

[d]HMS = Hawaiian monk seal.
[e]Temporary identification.
[f]CC Shark = cookie cutter shark (*Isistius brasiliensis*).
[g]One lobe missing.

Table 7.--Hawaiian monk seal cohort survival at Pearl and Hermes Reef at Pearl and Hermes Reef (M = male, F = female, and U = unknown sex).

| Year tagged | Sex | Known births (No.) | Pups tagged (No.) | No. of tags resighted by year | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 |
| 1983 | F | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | M | 8 | 8 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 |
| 1984 | F | 8 | 8 | | 8 | 6 | 4 | 4 | 4 | 4 | 4 |
| | M | 5 | 5 | | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 1985 | F | 7 | 6 | | | 5 | 5 | 5 | 5 | 5 | 5 |
| | M | 9 | 9 | | | 8 | 8 | 7 | 7 | 7 | 7 |
| | U | 3 | 0 | | | - | - | - | - | - | - |
| 1986 | F | 7 | 7 | | | | 7 | 7 | 7 | 7 | 7 |
| | M | 10 | 10 | | | | 7 | 6 | 6 | 4 | 4 |
| | U | 1 | 1 | | | | 1 | 0 | 0 | 0 | 0 |
| 1987 | F | 7 | 7 | | | | | 6 | 5 | 4 | 4 |
| | M | 14 | 14 | | | | | 10 | 10 | 9 | 9 |
| 1988 | F | 5 | 5 | | | | | | 5 | 5 | 5 |
| | M | 12 | 12 | | | | | | 11 | 9 | 9 |
| | U | 3 | 0 | | | | | | - | - | - |
| 1989 | F | 6 | 6 | | | | | | | 5 | 5 |
| | M | 8 | 8 | | | | | | | 6 | 6 |
| 1990 | F | 1 | 1 | | | | | | | | 1 |
| | M | 5 | 5 | | | | | | | | 5 |
| | U | 4 | 0 | | | | | | | | - |
| 1991 | F | 12 | 12 | | | | | | | | |
| | M | 9 | 9 | | | | | | | | |

Table 8.--Hawaiian monk seal entanglements in debris at Pearl and Hermes Reef (A = adult, M = male, U = unknown sex, ESC = escaped by itself.

| Field No. | Date | Size | Sex | ID No. | Islet/ Sector | Type of debris | Part of body entangled | Status |
|---|---|---|---|---|---|---|---|---|
| | | | | **1990** | | | | |
| | | | | No entanglements observed. | | | | |
| | | | | **1991** | | | | |
| 001 | 8/06 | W | M | BZ50 | GR/2[a] | -- | Neck[c] | ESC |
| 002 | 8/26 | A | U | -- | NI/5[b] | -- | Neck[c] | ESC |

[a]GR=Grass Island.
[b]NI=North Island.
[c]Neck scar only.

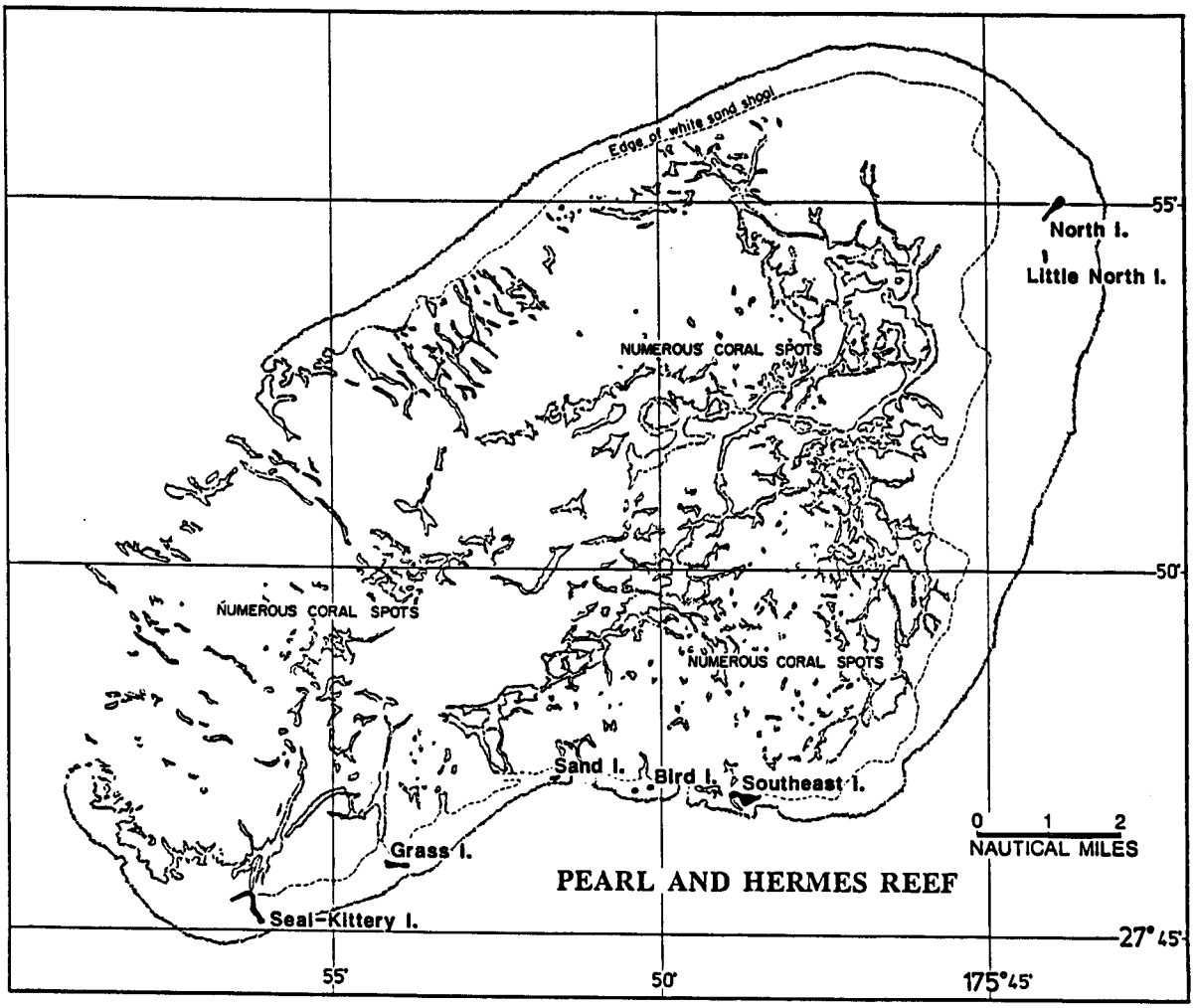


Figure 1.--Pearl and Hermes Reef, Northwestern Hawaiian Islands.

# APPENDIXES

Appendix A.--Itinerary of fieldwork conducted by the National Marine Fisheries Service at Pearl and Hermes Reef.

| Date | Event |
|---|---|
| | **1990** |
| 6/08 | NOAA Ship *Townsend Cromwell* arrives at Pearl and Hermes Reef. B. Becker and M. Morin disembark to conduct research on North Island and establish an overnight field camp. S. Conant, L. Laniawe, K. Niethammer, and R. Van Toorenburg disembark to conduct research on Southeast Island. M. Lee, K. Lombard, K. McDermond, and L. Timme disembark to conduct research on Seal-Kittery, Grass, Bird, and Sand Islands. |
| 6/09 | Two field parties deployed. Lee, Glueck, Timme conduct research on Southeast Island. Lombard, McDermond, Niethammer, and Van Toorenburg conduct research on Seal-Kittery, Grass, Bird, and Sand Islands. Becker and Morin conduct censuses on North and Little North Islands. All personnel embark in the evening, and the NOAA Ship *Townsend Cromwell* departs. |
| | **1991** |
| 8/01 | NOAA Ship *Townsend Cromwell* arrives at Pearl and Hermes Reef. R. Bauer, M. Finn, V. Gauger, J. Henderson, and L. Laniawe disembark and establish a field camp on Southeast Island. |
| 8/02 | First patrol of Southeast Island is conducted. |
| 8/03 | Field camp is established on North Island with Bauer and Laniawe. First census conducted of North and Little North Islands. |
| 8/05 | Change of personnel. Finn arrives at North Island field camp, and Bauer arrives at Southeast Island field camp. |
| 8/06 | First complete atoll count completed. |
| 8/11 | Change of personnel. Bauer and Gauger arrive at North Island field camp, and Finn and Laniawe arrive at Southeast Island field camp. |
| 8/19 | Change of personnel. Finn and Henderson arrive at North Island field camp, and Bauer and Gauger arrive at Southeast Island field camp. |
| 8/26 | Change of personnel. Bauer and Laniawe arrive at North Island field camp, and Finn and Henderson arrive at Southeast Island field camp. |

Appendix A.--Continued.

| Date | Event |
|---|---|
| 9/04 | Change of personnel. Finn and Henderson arrive at North Island field camp, and Bauer and Laniawe arrive at Southeast Island field camp. |
| 9/09 | North Island field camp disbanded. Finn and Henderson arrive at Southeast Island field camp. |
| 9/13 | NOAA Ship *Townsend Cromwell* arrives, Southeast Island field camp disbanded. Bauer, Finn, Gauger, Henderson, and Laniawe embark. |

Appendix B.--Hawaiian monk seal counts for individual islands at Pearl and Hermes Reef (M = male, F = female, and U = unknown sex).

| | Adult | | | Sub-adult | | | Juvenile | | | Pup | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | M | F | U | M | F | U | M | F | U | M | F | U | Nonpup | Pup | Combined |
| **1990** | | | | | | | | | | | | | | | |
| **North Island** | | | | | | | | | | | | | | | |
| 6/08 | 1 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 1 | 3 | 6 | 9 | 15 |
| 6/09 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 4 | 3 | 8 | 11 |
| **Little North Island** | | | | | | | | | | | | | | | |
| 6/08 | 2 | 4 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 10 |
| 6/09 | 1 | 2 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| **Southeast Island** | | | | | | | | | | | | | | | |
| 6/08 | 2 | 1 | 1 | 1 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 9 | 0 | 9 |
| 6/09 | 1 | 3 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 9 |
| **Seal-Kittery Island** | | | | | | | | | | | | | | | |
| 6/08 | 1 | 3 | 0 | 2 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 11 | 0 | 11 |
| 6/09 | 2 | 3 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 11 |
| **Grass Island** | | | | | | | | | | | | | | | |
| 6/08 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| 6/09 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| **Sand Island** | | | | | | | | | | | | | | | |
| 6/08 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 3 |
| 6/09 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **Bird Island** | | | | | | | | | | | | | | | |
| 6/08 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 5 | 0 | 5 |
| **1991** | | | | | | | | | | | | | | | |
| **North Island** | | | | | | | | | | | | | | | |
| 8/05 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 3 |
| 8/06 | 1 | 3 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 3 | 3 | 9 | 8 | 17 |
| 8/07 | 0 | 1 | 0 | 3 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 7 | 3 | 10 |
| 8/09 | 0 | 3 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 2 | 2 | 2 | 6 | 6 | 12 |

Appendix B.--Continued.

| | Adult | | | Sub-adult | | | Juvenile | | | Pup | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | M | F | U | M | F | U | M | F | U | M | F | U | Nonpup | Pup | Combined |
| 8/13 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 6 | 0 | 6 |
| 8/14 | 1 | 4 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 0 | 7 | 4 | 11 |
| 8/15 | 1 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 4 | 0 | 5 | 4 | 9 |
| 8/16 | 0 | 4 | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 1 | 4 | 0 | 9 | 5 | 14 |
| 8/18 | 2 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 0 | 8 | 3 | 11 |
| 8/20 | 2 | 3 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 8 | 3 | 11 |
| 8/21 | 0 | 3 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 3 | 0 | 6 | 4 | 10 |
| 8/23 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 0 | 6 | 3 | 9 |
| 8/24 | 0 | 5 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 11 | 2 | 13 |
| 8/25 | 2 | 5 | 0 | 2 | 1 | 0 | 1 | 2 | 0 | 1 | 4 | 0 | 13 | 5 | 18 |
| 8/26 | 2 | 7 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 1 | 4 | 0 | 16 | 5 | 21 |
| 8/27 | 2 | 7 | 1 | 2 | 1 | 0 | 4 | 2 | 1 | 1 | 3 | 0 | 20 | 4 | 24 |
| 8/28 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 2 | 6 |
| 8/29 | 1 | 4 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 1 | 3 | 0 | 13 | 4 | 17 |
| 8/30 | 2 | 8 | 0 | 1 | 0 | 0 | 3 | 1 | 1 | 0 | 3 | 0 | 16 | 3 | 19 |
| 8/31 | 0 | 5 | 1 | 2 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 12 | 1 | 13 |
| 9/01 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 5 | 0 | 7 | 5 | 12 |
| 9/02 | 2 | 3 | 1 | 0 | 1 | 0 | 1 | 2 | 0 | 2 | 3 | 0 | 10 | 5 | 15 |
| 9/05 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 6 | 2 | 8 |
| 9/06 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 4 | 0 | 8 | 5 | 13 |
| 9/07 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 5 | 3 | 8 |
| 9/08 | 2 | 4 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | 0 | 2 | 0 | 14 | 2 | 16 |
| **Little North Island** | | | | | | | | | | | | | | | |
| 8/06 | 0 | 1 | 4 | 2 | 1 | 0 | 0 | 1 | 3 | 1 | 0 | 1 | 12 | 2 | 14 |
| 8/09 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 3 | 1 | 4 |
| 8/13 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 1 | 5 |
| 8/15 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| 8/18 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 5 | 1 | 6 |
| 8/20 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 4 |
| 8/21 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 |
| 8/23 | 1 | 2 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| 8/24 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 |
| 8/25 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 3 |
| 8/28 | 3 | 2 | 0 | 0 | 2 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 11 | 1 | 12 |
| 8/29 | 3 | 3 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 9 | 3 | 12 |
| 8/31 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 3 | 1 | 4 |
| 9/01 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 4 |
| 9/05 | 1 | 1 | 2 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 8 |
| 9/06 | 2 | 3 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 8 | 1 | 9 |
| 9/07 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 6 | 2 | 8 |
| 9/08 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 8 | 1 | 90 |

Appendix B.--Continued.

| Date | Adult | | | Sub-adult | | | Juvenile | | | Pup | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | U | M | F | U | M | F | U | M | F | U | Nonpup | Pup | Combined |
| **Southeast Island** | | | | | | | | | | | | | | | |
| 8/06 | 2 | 3 | 1 | 2 | 3 | 1 | 4 | 2 | 2 | 1 | 0 | 0 | 20 | 1 | 21 |
| 8/09 | 2 | 1 | 1 | 1 | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 9 | 1 | 10 |
| 8/10 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| 8/11 | 5 | 3 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 13 | 0 | 13 |
| 8/12 | 4 | 0 | 0 | 3 | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 11 | 1 | 12 |
| 8/13 | 3 | 3 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 10 |
| 8/14 | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| 8/15 | 2 | 0 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 |
| 8/16 | 7 | 0 | 0 | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 13 | 0 | 13 |
| 8/18 | 2 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 7 | 2 | 9 |
| 8/20 | 2 | 1 | 0 | 4 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 9 | 1 | 10 |
| 8/21 | 4 | 1 | 0 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 11 | 1 | 12 |
| 8/22 | 2 | 2 | 2 | 3 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 12 | 0 | 12 |
| 8/24 | 6 | 1 | 0 | 4 | 1 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 15 | 2 | 17 |
| 8/25 | 1 | 2 | 2 | 3 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 11 | 1 | 12 |
| 8/28 | 4 | 1 | 0 | 2 | 2 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 11 | 2 | 13 |
| 8/29 | 3 | 5 | 0 | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 14 | 1 | 15 |
| 8/30 | 3 | 3 | 0 | 4 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 15 | 0 | 15 |
| 8/31 | 3 | 1 | 0 | 6 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 12 | 1 | 13 |
| 9/01 | 3 | 2 | 0 | 6 | 3 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 16 | 1 | 17 |
| 9/02 | 3 | 2 | 0 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 13 |
| 9/05 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 |
| 9/06 | 4 | 3 | 3 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 16 | 1 | 17 |
| 9/08 | 4 | 3 | 2 | 3 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 15 | 1 | 16 |
| 9/10 | 3 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| 9/11 | 6 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 11 | 1 | 12 |
| 9/12 | 6 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 15 | 0 | 15 |
| **Seal-Kittery Island** | | | | | | | | | | | | | | | |
| 8/04 | 1 | 1 | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 10 | 2 | 12 |
| 8/06 | 1 | 2 | 0 | 2 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 9 | 1 | 10 |
| 8/09 | 3 | 3 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 11 | 1 | 12 |
| 8/13 | 2 | 6 | 2 | 3 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 16 | 0 | 16 |
| 8/15 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 6 | 1 | 7 |
| 8/21 | 1 | 4 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 9 | 2 | 11 |
| 8/24 | 3 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 8 | 2 | 10 |
| 8/28 | 4 | 2 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 11 | 1 | 12 |
| 8/31 | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 8 | 0 | 8 |
| 9/01 | 3 | 3 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 9 | 1 | 10 |
| 9/06 | 2 | 3 | 1 | 3 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 12 | 0 | 12 |
| 9/08 | 3 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 |

Appendix B.--Continued.

| Date | Adult | | | Sub-adult | | | Juvenile | | | Pup | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | U | M | F | U | M | F | U | M | F | U | Nonpup | Pup | Combined |
| **Grass Island** | | | | | | | | | | | | | | | |
| 8/04 | 1 | 3 | 1 | 3 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 10 | 2 | 12 |
| 8/06 | 0 | 0 | 0 | 3 | 2 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | 7 | 3 | 10 |
| 8/09 | 3 | 1 | 0 | 4 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 10 | 3 | 13 |
| 8/13 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 6 | 2 | 8 |
| 8/15 | 3 | 2 | 0 | 3 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 10 | 2 | 12 |
| 8/21 | 2 | 2 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 7 | 1 | 8 |
| 8/24 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 |
| 8/28 | 3 | 3 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 10 |
| 8/31 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| 9/01 | 2 | 2 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 |
| 9/06 | 1 | 1 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 |
| 9/08 | 1 | 4 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 8 |
| **Sand Island** | | | | | | | | | | | | | | | |
| 8/06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9/01 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 9/06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9/08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Bird Island** | | | | | | | | | | | | | | | |
| 8/06 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| 8/09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3[a] | 0 | 3 |
| 8/13 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8/15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8/21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/24 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8/28 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| 8/31 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 4 |
| 9/01 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 4 |
| 9/06 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 3 |
| 9/08 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |

Appendix B.--Continued.

| Date | Adult | | | Sub-adult | | | Juvenile | | | Pup | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | U | M | F | U | M | F | U | M | F | U | Nonpup | Pup | Combined |
| **Other[b]** | | | | | | | | | | | | | | | |
| 8/6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8/15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8/24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8/28 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8/31 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 9/1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 9/6 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| 9/8 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |

[a]Total includes some seals which were not placed in any size class.
[b]Indicates sandbars, rocks, and reef haul-out areas.

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